

# PERSISTENCE AND SEASONAL OCCURRENCE OF BIRDS IN A SOUTHERN PERTH SUBURB

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## ABSTRACT

Most of the natural bushland habitats of the Perth metropolitan area have been removed and replaced with suburban areas. This has resulted in reduced avifaunal diversity, and changes to bird species composition and abundance. I recorded the avifauna of a suburban area in southern Perth during 113 observation days over a period of 21 months. The 27 native species recorded are a subset of those that occurred historically; six introduced species were also recorded. An average of 11.87 and mode of 13 species were recorded per day (range 7 to 18). Most species had been recorded by day 21, and no new species were recorded in the last 38 days, suggesting that the inventory was complete. Regularly recorded species (6 native and 2 introduced) were resident, recorded throughout the year, and were able to utilise the available resources in gardens and parks. Nomadic species or those in passage were recorded less frequently, and small insectivores and raptors were recorded rarely or were no longer present in the study area. Rainbow Bee-eater was the most obviously seasonal in its occurrence. Retention of native bushland and planting native species along streets and in gardens would enhance the persistence of native birds in suburban settings.

## INTRODUCTION

The existence and abundance of animals in an area is largely determined by the array of habitats that exist, and the opportunities, in terms of resources, that are available (Elton 1927; Pianka 1983; Wiens 1989; Recher 1991). Establishment of an urban environment constitutes a major modification to habitat, entailing removal of landscapes and their associated

native vegetation and replacement with artificial shelter structures (houses and buildings) and an array of (often non-native) plant species. During this process the local fauna is eliminated entirely or is temporarily displaced, but some species recolonise suburbia and utilise the modified environments that have been created. As a consequence of urban expansion and fragmentation of

habitat we may anticipate significant changes to the avifauna (Vale and Vale 1976; Jones 1981; Ford *et al.* 2001; Garden *et al.* 2006; Berry and Berry 2008).

The natural environment of the Perth region has undergone radical changes since European settlement, and urban expansion has continued to accelerate in the past few decades. This expansion has resulted in the loss of extensive areas of habitat, particularly on the Swan Coastal Plain. Associated historical changes in bird species composition and abundance have been noted by several authors (Alexander 1921; Serventy 1948; Serventy and Whittell 1976; Storr and Johnstone 1988; Recher and Serventy, 1991), and a selection of native birds have declined or become locally extinct (Recher and Serventy 1991; How and Dell 1993; Berry and Berry 2008; Government of Western Australia 2000). However, a range of native species persist in bushland remnants near Perth and some are moderately common in parks and gardens (Abbott 2009; Serventy 1948; How and Dell 1990; Mawson and Massam 1995; Recher 1997, 2004; Van Delft 1997; Gole 2004; Reynolds 2008; Davis *et al.* 2013). In addition, introduced species may become abundant in suburban environments (Green 1984; Antos *et al.* 2006; Garden *et al.* 2006). These changes to bird communities are mirrored in urban and suburban areas in other parts of Australia (Jones 1981, 1983; Green 1984; Parsons *et al.* 2006).

Urban habitats are typified by a small-scale habitat mosaic (Gilbert 1989) in which some avifauna species persist. Habitat characteristics that typically determine habitat selection of birds in natural woodland environments may differ from those in urban situations (Emlen 1974; Jones 1981; Chace and Walsh 2006; Luck *et al.* 2013).

This study was initiated to determine the diversity of bird species observable in a study site in the southern Perth suburb of Hamilton Hill, and to examine patterns of seasonal presence. The species recorded were a subset of the avifauna that occur in the area and the region, and that occurred historically. I examine why particular species persist at the site and how they respond to the available (sub-urban) habitat features.

## METHODS

The study site was at Paulik Way, Hamilton Hill, in the southern Perth metropolitan area five kilometres south-east of Fremantle. The site is on the Swan Coastal Plain, and lies on the Spearwood Dunes System (Seddon 1972; Semeniuk and Glassford 1989) two kilometres from the coast. Roads form an extensive network in the area, which largely consists of suburban housing and a nearby light industrial area. The natural soil cover is sandy with occasional outcrops of Tamala limestone, and the vegetation consists of

suburban gardens, parks and street plantings. Based on plants present in remnant patches the original vegetation is likely to have consisted of a moderately diverse *Banksia* woodland with stands of Marri *Corymbia calophylla*, Tuart *Eucalyptus gomphocephala*, Jarrah *E. marginata*, *Allocasuarina fraseriana*, Balga *Xanthorrhoea preissii* and Parrot Bush *Dryandra sessilis*.

Major habitat trees in the study site included several large specimens of the Port Jackson Fig *Ficus rubiginosa*, miscellaneous eucalypts planted along the street, and sporadic individual *Melaleuca*, *Grevillea* and *Callistemon* spp. There are also palms, false cypress, olives and various ornamentals planted in gardens. At the nearby Phoenix Primary School (250 metres south) there is a grassed oval and a stand of taller eucalypts which include Tuart and other species, and Peppermint *Agonis flexuosa*. The nearest remnant of relatively substantial bushland in the area is at Manning Lake, 750 metres WSW of the site. This permanent wetland is bounded by a fringing forest of *Melaleuca raphiophylla* and there are remnant Tuart and *Banksia attenuata* trees. West of the lake there is a substantial patch of coastal vegetation (Department of CALM 2006). To the north and east of the study site there is remnant vegetation along the proposed extension to the Roe Highway (along Blackwood Ave.), including a small patch of Marri

and areas with Balga. This provides a potential bushland corridor that extends eastward to Bibra Lake, which is a major part of the eastern portion of Beeliar Regional Park (Department of CALM 2006). The swamps of the western Beeliar wetland chain (south of the study site) were at one stage bordered by market gardens, but now are mostly surrounded (and isolated by) newly developed residential areas.

From June 2001 to February 2003 (21 months) I recorded the bird species inhabiting the site. Most avifauna records were on the basis of calls, which were observed from an elevated position or 'listening point' centred at 32°05'22"S, 115°46'48"E. The listening point was seven metres above the ground and faced in a southerly direction. Calls were generally audible to a distance of c. 400 metres, but this was dependent on the sound intensity of species vocalisations, wind direction, and other weather conditions. Some species were seen from the balcony or during walks in the immediate vicinity (within 250 metres) and these were noted. Waterbirds in transit (with the exception of Silver Gull) and domestic birds (rooster, Cockatiel, cage birds) were not included in the sampling. Avifauna nomenclature and family sequence follows Christidis and Boles (2008).

Birds were noted as present or absent on each observation day. A day was included in the

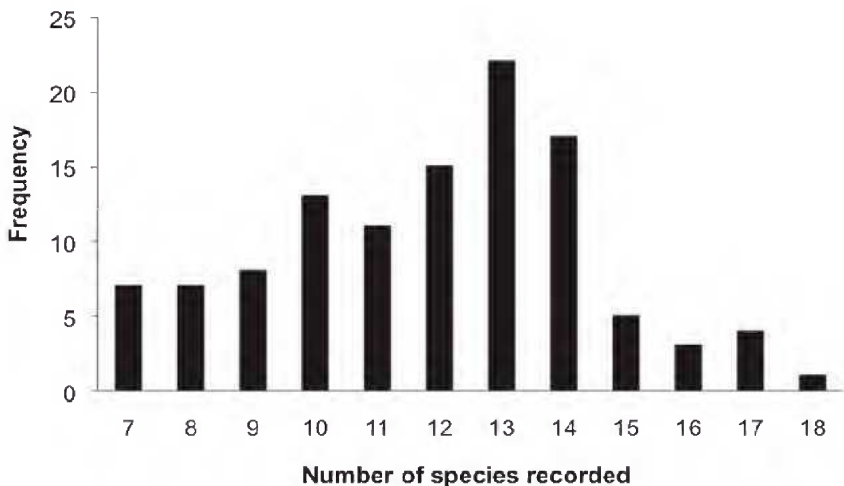
dataset only where sufficient time (several hours) and effort was spent recording. Data are presented for 113 observation days. For the presentation of seasonal occurrence data, the observation records were collated into periods of a third of a month, i.e. ten (or eleven) days. Species were noted as present if they had been recorded on any day within a period. Months for which there are no data (as indicated on the Figures) were July and December 2001, and there are period gaps in early June and August 2002. The ten species recorded in less than eight periods are not shown in the Figures.

## RESULTS

A total of 27 native and six introduced species (including

three species native to Australia but not to south-western Australia) were recorded from the study area (Table 1). The average number of species recorded per day was 11.87 (range 7 to 18) with a mode of 13 (Figure 1). The most frequently recorded species were Singing Honeyeater (recorded every day), Australian Raven (97% of days) and Red Wattlebird (91%). The introduced species Rainbow Lorikeet and Laughing Dove were also frequently recorded. Eight species were recorded frequently (> 70%), and 15 were infrequent (< 20%). Nine species were rarely recorded (< 5%; Table 1), and Brown Goshawk, Black-shouldered Kite and Western Gerygone were recorded only once each.

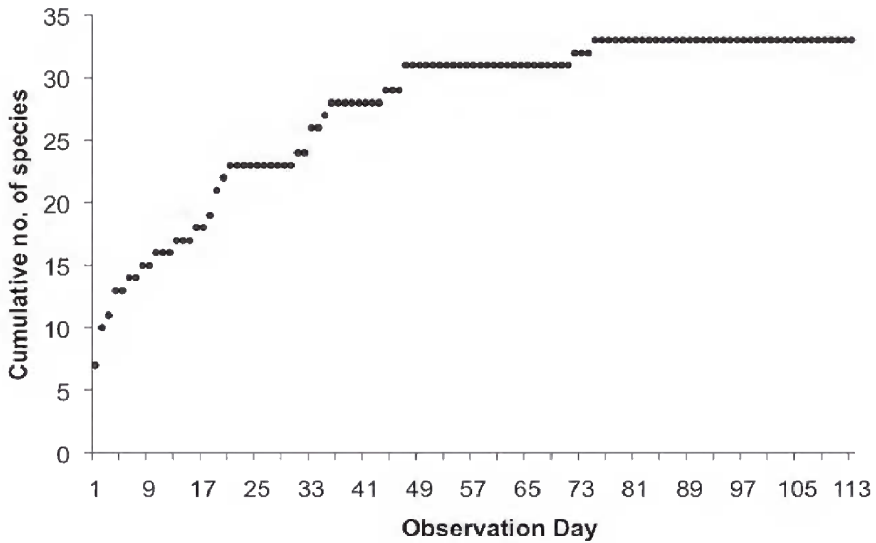
The number of species recorded increased regularly during the first 20 observation days (Figure 2). A total of 23 species (70% of



**Figure 1.** Number of bird species recorded per observation day (n = 113) from a suburban area in Hamilton Hill, Perth metropolitan area.

**Table 1.** Avifauna species recorded and frequency of observations (F: percentage of 113 observation days) at Paulik Way, Hamilton Hill, over a period of 21 months. Site refers to the immediate vicinity (typically within 400 m), whereas area includes the site and surrounds within a c.1 km radius of the listening point.  
 \* = introduced species; † = 10 commonly recorded species in Perth reserves (Gole 2004).

Species	F	Notes
*Feral Pigeon <i>Columbo livia</i>	38.1	site resident (feral) – numbers increasing
*Spotted Dove <i>Streptopelia chinensis</i>	47.8	site resident (feral)
*Laughing Dove <i>Streptopelia senegalensis</i>	79.6	site resident (feral)
Brown Goshawk <i>Accipiter fasciatus</i>	0.9	single record
Black-shouldered Kite <i>Elanus axillaris</i>	0.9	single record
Australian Hobby <i>Falco longipennis</i>	2.6	uncommon in area
Nankeen Kestrel <i>Falco cenchroides</i>	1.8	recorded twice
Silver Gull <i>Chroicocephalus novaehollandiae</i>	20.4	in passage to Manning Lake
†Galah <i>Eolophus roseicapillus</i>	56.6	area resident
*Little Corella <i>Cacatua sanguinea</i>	11.5	small flock in area
Carnaby's Black Cockatoo <i>Calyptorhynchus latirostris</i>	44.2	irregular visitor to area
†Australian Ringneck <i>Barnardius zonarius</i>	40.7	feeding visitor to site
Red-capped Parrot <i>Purpureicephalus spurius</i>	2.6	infrequent visitor
*Rainbow Lorikeet <i>Trichoglossus haematodus</i>	87.6	regular visitor or in passage
Pallid Cuckoo <i>Cacomantis pallidus</i>	3.5	infrequent migrant
*Laughing Kookaburra <i>Dacelo novaeguineae</i>	7.1	area resident (?)
Rainbow Bee-eater <i>Merops ornatus</i>	36.3	seasonal migrant
Western Gerygone <i>Gerygone fusca</i>	0.9	single record
Striated Pardalote <i>Pardalotus striatus</i>	3.5	infrequent visitor
†Red Wattlebird <i>Anthochaera carunculata</i>	91.1	site resident
†Singing Honeyeater <i>Lichenostomus virescens</i>	100	site resident
†Brown Honeyeater <i>Lichmera indistincta</i>	49.6	site resident
New Holland Honeyeater <i>Phylidonyris novaehollandiae</i>	11.5	nomadic area resident
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>	38.1	site and area visitor
Grey Butcherbird <i>Cracticus torquatus</i>	4.4	area resident (?)
†Australian Magpie <i>Cracticus tibicen</i>	75.2	site resident, local movements
Willie Wagtail <i>Rhipidura leucophrys</i>	76.1	site resident
†Australian Raven <i>Corvus coronoides</i>	97.3	site resident, local movements
†Magpie-lark <i>Grallina cyanoleuca</i>	70.8	area resident, attracted to local food resources
†Silvereye <i>Zosterops lateralis</i>	53.1	observed in flight
Welcome Swallow <i>Hirundo neoxena</i>	5.3	observed in flight
Tree Martin <i>Petrochelidon nigricans</i>	8.0	observed in flight
Mistletoebird <i>Dicaeum hirundinaceum</i>	19.5	sporadic site visitor



**Figure 2.** Species accumulation curve for birds recorded over a period of 21 months (n = 113 observation days) from a suburban area in Perth.

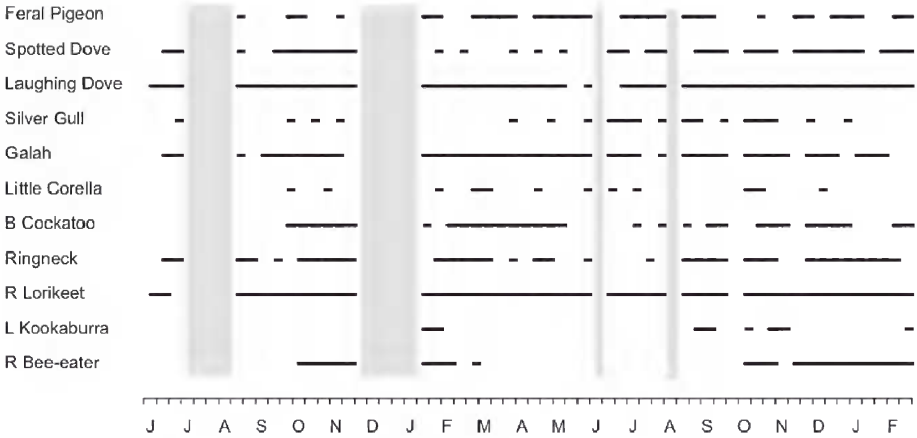
the total) had been recorded by observation day 21 and 31 species (94%) by day 47. All of the regularly encountered species (50+% frequency) had been recorded by observation day 4. The final two species recorded were Brown Goshawk (day 72) and Western Gerygone (day 75); no new species were recorded during the last 38 observation days (Figure 2).

Seasonal occurrence data comprised 51 periods of a third of a month. The number of observation days within each period varied from one to four, but most periods included two (n = 31) or three (n = 14) days.

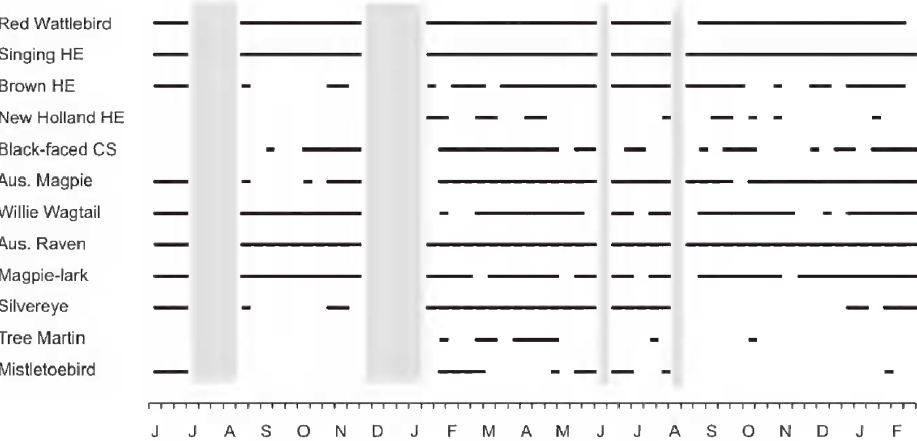
Of the two resident introduced doves, Laughing Dove was recorded more often than Spotted Dove (Figure 3). Feral Pigeon was

observed more frequently after February 2002 and numbers were increasing. Silver Gull was recorded irregularly in passage (37% of periods). The exotic and invasive Rainbow Lorikeet was evident throughout the year, and Australian Ringneck and Galah were also frequent at the site (Figure 3). Little Corella was sporadic in its occurrence but is resident at nearby Manning Lake. There was no clear seasonal pattern of occurrence of Carnaby's Black Cockatoo. Laughing Kookaburra called in spring and summer but was only evident in 16% of periods.

The resident meliphagids Singing Honeyeater and Red Wattlebird were recorded throughout the year. Brown Honeyeater was present except during Septem-



**Figure 3.** Seasonal occurrence of non-passerines in a suburban area in Perth from June 2001 to February 2003. Presence is indicated on the basis of periods of a third of a month. Grey shading indicates no observations for the period. Refer to Table 1 for scientific names. B Cockatoo = Carnaby's Black Cockatoo, R = Rainbow, L Kookaburra = Laughing Kookaburra.



**Figure 4.** Seasonal occurrence of passerines in a suburban area in Perth. Details as for Figure 3. HE = Honeyeater, CS = Cuckoo-shrike, Aus. = Australian.

ber–October 2001 and most of October–November 2002 (Figure 4). New Holland Honeyeater was the least frequently observed honeyeater (23% of periods). Open country birds were among

the most frequently recorded, and included resident Australian Raven (recorded in all periods), and Australian Magpie, Magpie-lark and Willie Wagtail, which were present at all times of year

(Figure 4). Black-faced Cuckoo-shrike was a visitor to the site and was present during 61% of periods.

The most regular seasonal visitor was Rainbow Bee-eater which was present in spring and summer, arriving in late September and departing in late February or early March. Pallid Cuckoo was heard infrequently in September and October. Tree Martin was an irregular visitor in 2002 but was not recorded in the other years (Figure 4). Silvereye was present regularly for the first half of 2002 but was not recorded in the second half of the year, and Striated Pardalote was only heard in autumn. Mistletoebird was an irregular visitor evident for brief periods (from a single period to over a month).

## DISCUSSION

In terms of the avifauna of the Perth region, the species richness for the suburban study area was low, comprising 27 native bird species. The list includes the ten commonly recorded species in Perth reserves (Gole 2004; Table 1), as well as common introduced birds. Abbott (2009) recorded a similar number of species in West Leederville over a seven year period.

No new species were recorded in the last six months of observations, suggesting that although there is potential for additional species, it is an almost complete inventory of the avifauna. Bushland sites within

the urban matrix of Perth support a wider range of birds; for example, 44 species in Kings Park (Recher and Serventy 1991), 61 species in Bold Park (How and Dell 1990), and 50 species at Shenton Bushland (Berry and Berry 2008). Davis *et al.* (2013) identified 79 native species (excluding waterbirds, nocturnal and exotic species) from reserves across the broader Perth region, and Storr and Johnstone (1988) list approximately 130 native species of bushbird for the Swan Coastal Plain (including raptors but excluding seabirds, shorebirds and waterbirds). However, this geographical region includes a wide range of habitats and sites. Clearly then, the species present in the study area are a relatively small subset of the avifauna that occur in the region.

The number of species recorded per day reflected both observation effort and time of year. Some species call throughout the year (e.g. Singing Honeyeater) and are detectable at all times, whereas others are more vocal during the breeding season. Recher and Serventy (1991) noted that more species were seen and heard in winter and spring, with the highest number in September. Calling activity is influenced by time of day, season, weather conditions (e.g. calling may be curtailed during periods of rain and windy weather), and, in urban environments, by artificial noise such as traffic and airplanes. Loud calls tend to carry and are more likely



to be perceived by an observer. For example, Rainbow Lorikeet was not overly abundant and was recorded almost exclusively in passage yet it advertised its presence and so was recorded frequently. In contrast, it is not always clear for some infrequently recorded species (e.g. Mistletoebird, Brown Goshawk) if they are absent, or are merely being discreet and not vocalising (Reynolds 2010). Highly vocal (and frequently recorded) species included Singing Honeyeater, Red Wattlebird, Magpie-lark and Australian Raven. The census method relied largely on detection on the basis of calls, supplemented with sight records, hence species that call regularly and loudly may have been recorded more frequently.

The species recorded most consistently were local site residents that are sedentary and occupy territories in the immediate vicinity, e.g. Singing Honeyeater, Australian Raven and Red Wattlebird. Other residents including Australian Magpie, Laughing Dove and Willie Wagtail were recorded in all months and with an observation frequency of 70% or more (Table 1). On an average day, just over a third of the total species were recorded, and the daily list always included some or all of the local residents. Species such as Australian Magpie, Magpie-lark and Willie Wagtail have been favoured by the availability of open habitats (Serventy and Whittell 1976), including ovals,

parks and gardens (Davis *et al.* 2013). This contrasts with the situation prior to the expansion of Perth, when Alexander (1921) listed the Magpie-lark as uncommon. Willie Wagtail persists in some suburban areas, but may have stricter habitat requirements than the other black and white birds.

Visitors to the site were recorded less frequently than residents. Species that appear to be locally nomadic include New Holland Honeyeater and Silvereye. These birds were attracted to food resources such as blossom, swarms of insects, and fruits of *Ficus rubiginosa*. They use specific localities on a temporary basis and must move in a wider area following resources. Species that may be regional nomads were Black-faced Cuckoo-shrike, Red-capped Parrot, Australian Ringneck and Mistletoebird. The infrequent occurrence of Red-capped Parrot may be due to its reliance on seeds of native plants such as Marri, Tuart and *A. fraseriana* (Johnstone and Storr 1988), which are rare in the area. In contrast, Australian Ringneck utilises food resources from exotic plants and was recorded more frequently.

Rainbow Bee-eater arrived in flocks of 20+ birds and roosted communally in large street trees. The birds then dispersed to breed in pairs. This species is a summer visitor from northern Australia and was the most clearly seasonal migrant. Pallid Cuckoo was the only species of cuckoo recorded;

it was heard on four occasions in spring. Carnaby's Black Cockatoo did not demonstrate a distinct seasonal pattern of occurrence. It is known to visit near coastal areas in the non-breeding season (mostly January to June; Saunders 1980), but in the study area individuals were present in the breeding and non-breeding seasons. Remnant bushland in the area supplies a food source (Saunders 1980) of seeds of *Marri*, *Banksia*, *Dryandra* and *Hakea* spp., and *Pinus* spp. occur in parks and as street trees. The regular movements of this Cockatoo in the region may have been disrupted by habitat fragmentation.

Little Corella, Rainbow Lorikeet and Laughing Kookaburra are native to Australia but not to the Perth region. Feral Pigeon occurred in flocks and was abundant, due in part to being supplied with food. Laughing Dove was recorded more frequently than Spotted Dove, and is probably the more abundant of the two species, but both are firmly established. The availability of open feeding areas and grains supplied to domestic animals (e.g. chickens) are likely to influence their abundance in suburban situations. Supplemental feeding needs to be discontinued to discourage these species.

Perth is fortunate in that it has fewer introduced species than suburban areas in eastern Australia, where non-native species make up a major proportion of the birds present (Jones 1981;

Green 1984; pers. obs.). The Rainbow Lorikeet is now widespread in Perth and was frequently recorded. The population has rapidly expanded and (as in parts of its natural range) forms large noisy flocks in roosting trees (pers. obs.). Competition for resources is likely to occur, for example Rainbow Lorikeet and Red Wattlebird forage at blossom together, and lorikeets may exclude smaller species from nesting hollows (Chapman 2005). Laughing Kookaburra is possibly resident in the area, but may have a large home range. Finally, Silver Gull is a commensal in urban areas and was recorded in passage between Manning Lake, the coast and areas further inland.

Four species of raptors were recorded and all were observed infrequently. Birds of prey are less common than in the past. For example, Serventy (1948) considered the Brown Goshawk to be 'plentiful', whereas there was a single record of this species in this study in 21 months (Table 1). There was also a complete absence of nocturnal birds in the study area. Southern Boobook *Ninox novaeseelandiae* occurs in established suburbs with large trees, but most nocturnal species are now largely absent from the Swan Coastal Plain, and Bush Stone-curlew *Burhinus grallarius* has long since disappeared (Storr and Johnstone 1988).

Small passerines were poorly represented at the study site; Western Gerygone was recorded

once, and Striated Pardalote on four occasions, whereas Weebill *Smicronis brevirostris*, Yellow-rumped Thornbill *Acanthiza chrysorrhoa*, Grey Fantail *Rhipidura fuliginosa* and Rufous Whistler *Pachycephala rufiventris* were not present. These species occur in metropolitan reserves (Gole 2004) and all occur at nearby Manning Lake (pers. obs.). Western Gerygone and Yellow-rumped Thornbill were recorded regularly in a small patch of remnant bushland (Reynolds 2008), suggesting that these species have a requirement for native plant communities. To give some indication of historical changes, Alexander (1921) listed the Weebill as 'common, especially in the Tuart country near the coast', the Western Gerygone as 'the commonest small bird of the district, universally distributed' and Rufous Whistler as 'plentiful', yet these species are unable to persist in suburbia. Honeyeaters that have disappeared from the area include Western Spinebill *Acanthorhynchus superciliosus*, Western Wattlebird *Anthochaera lunulata* and the Yellow-plumed Honeyeater *Lichenostomus ornatus* which was previously a 'common resident of the tuart forest' (Serventy 1948). Species that do poorly are generally those with specialised habitat or feeding requirements (Gilbert 1989; Garden *et al.* 2006). Ground nesting birds and those that require thick scrub (e.g. Splendid Fairy-wren *Malurus splendens*, White-browed Scrubwren

*Sericornis frontalis*) have also declined or become locally extinct in urban areas.

Habitat requirements include adequate food, shelter, nesting and roosting sites. Recher (1991) noted that forests provide specific requirements such as nest sites (including tree hollows and dead branches) and nesting materials, but also a variety of foraging substrates and food types. It takes many years for trees to mature and develop nesting hollows, and although such trees exist at Manning Lake, large old trees are rare at the study site. Garden plantings may provide habitat and influence the density of birds in suburban areas (Vale and Vale 1976; Jones 1981). This will depend on the species of plants, vegetation characteristics, and the availability of nectar-rich plants (Young *et al.* 2007; Luck *et al.* 2013). Suburban habitat may thus complement bushland areas or provide foraging areas for birds that live in remnants. In the local area plantings of native species in house gardens provide some nectar and other resources. Further planting of an array of native shrubs and trees would enhance habitat quality and encourage use by birds.

As urbanisation continues to penetrate into the Perth metropolitan hinterland, the forests, woodlands and wetlands give way to suburbia. This change in configuration of habitats has affected the composition of the bird community, and due to

fragmentation and local extinction avifaunal diversity has declined over time (Serventy 1948; How and Dell 1993; Recher 1997; Berry and Berry 2008). Hamilton Hill is largely denuded of native vegetation, and the native plants that remain are restricted to parks, gardens, school yards and road verges. The percentage of bare spaces that do not support fauna (e.g. roads) is increasing; these areas are effectively non-habitat. Vegetation cover is an important determinant of persistence (Davis *et al.* 2013), and retention of bushland aids in the survival of native birds (Chace and Walsh 2006; Berry and Berry 2008). Larger areas of native vegetation support more diverse avifaunal assemblages (e.g. Bold Park; How and Dell 1990). However, even small bushland remnants have potential value as habitat (Turpin 1990; Mawson and Massam 1995; Fischer and Lindenmayer 2002; Hodgson *et al.* 2006; Reynolds 2008). At a broader scale large areas of remnant vegetation such as in Beeliar Regional Park (Department of CALM 2006) act as habitat for source populations of birds that forage in the suburbs. Manning Lake and surrounding bushland is an additional source area, but there are few other bushland remnants in the district. Creation of corridors by retention of natural or near natural areas, habitat restoration and planting of native gardens would facilitate the reactivation

of natural processes such as movement patterns.

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